Water Quality for Bioluminescent Mangrove Lagoon in St. Croix, USVI

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Bioluminescence

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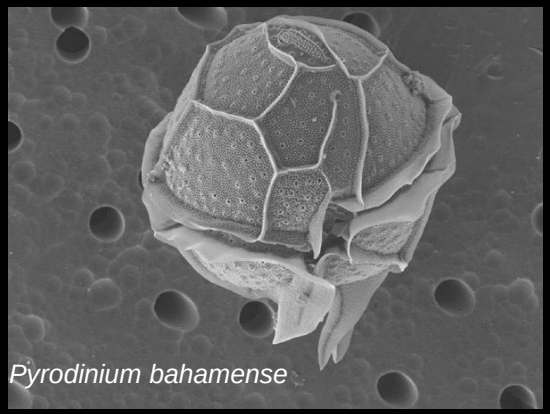
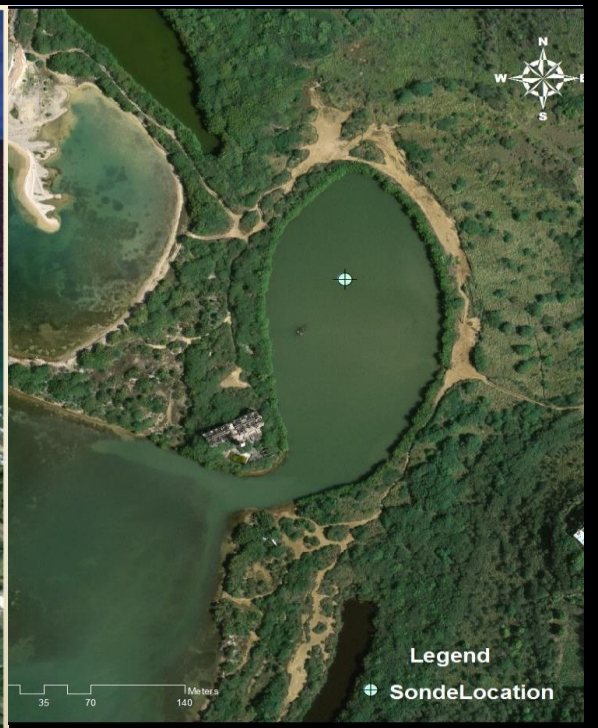

Pyrodinium bahamense

- Caused by dinoflagellate, *Pyrodinium bahamense*
- Possible explanation: Burglar Alarm Theory
- Distributed all throughout Caribbean and Atlantic
- Caused by oxidation reaction of luciferin
- Short residence time + shallow + mangrove coverage

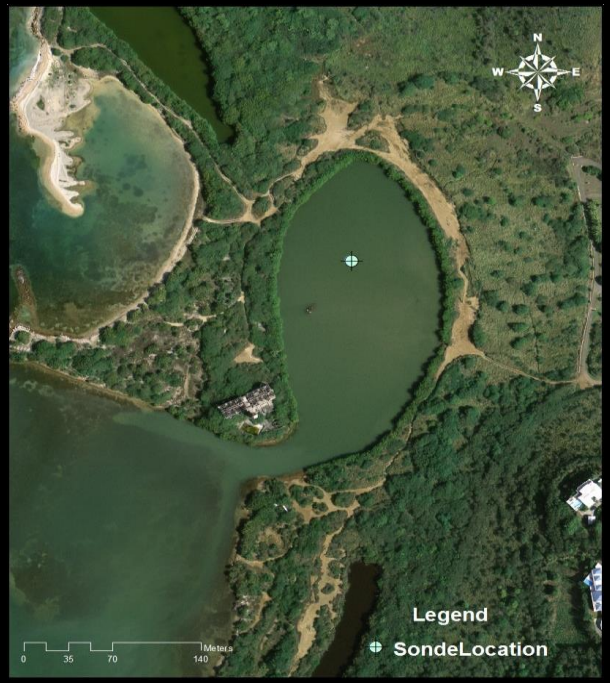
Bioluminescence in SARI



Location	Area (m^2)
Oster Bay, Jamaica	29
Puerto Mosquito, PR	9
Laguna Grande, PR	5
Mangrove Bay, VI	0.3

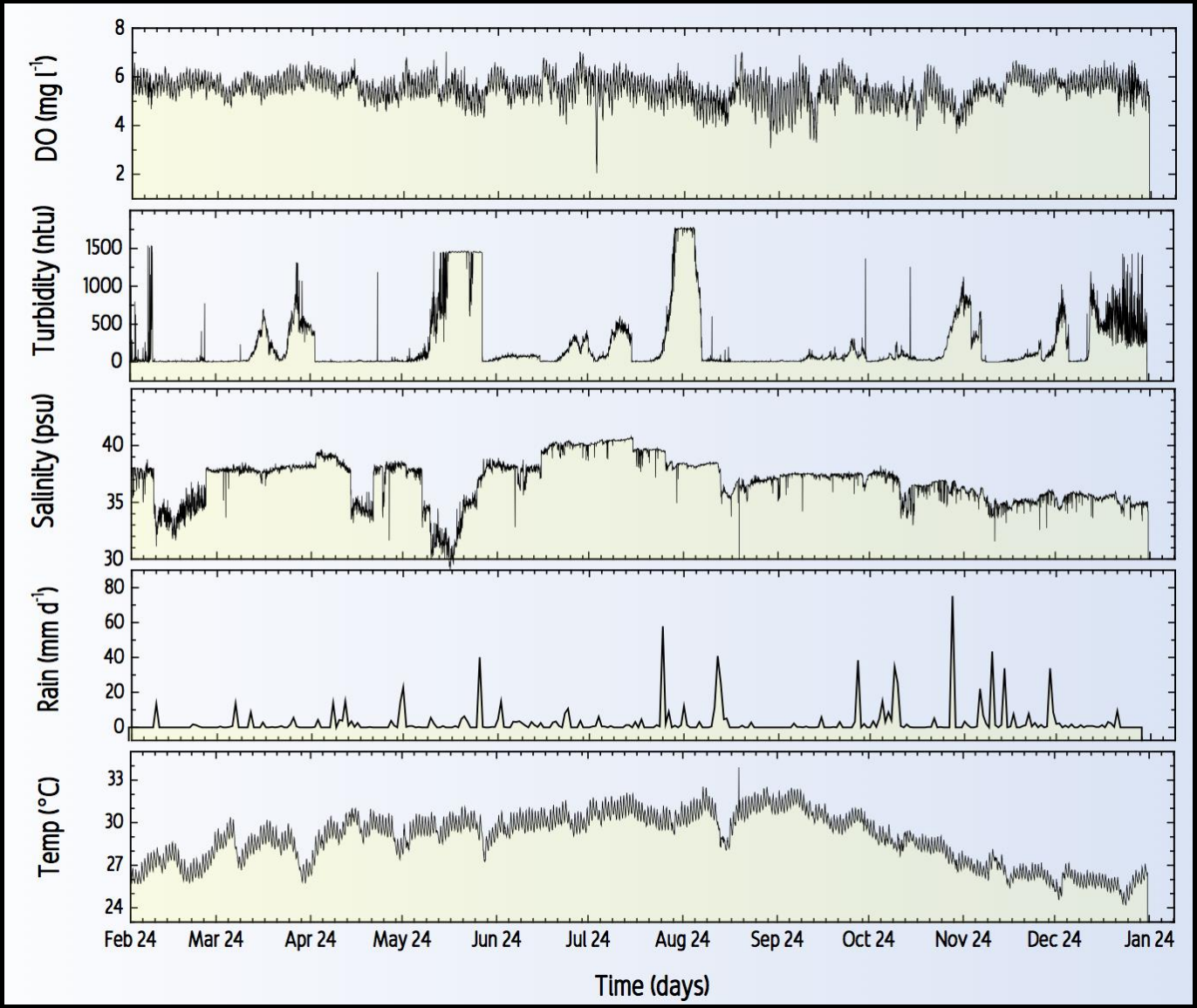
- Salt River Bay National Historical Park and Ecological Preserve (SARI) - 1992
- Mangrove Lagoon is a small, shallow manmade embayment
- Maximum depth: 2.2 m
- "*Ecological Characterization of Bioluminescence in Mangrove Lagoon, St. Croix*"

In situ Water Quality Monitoring

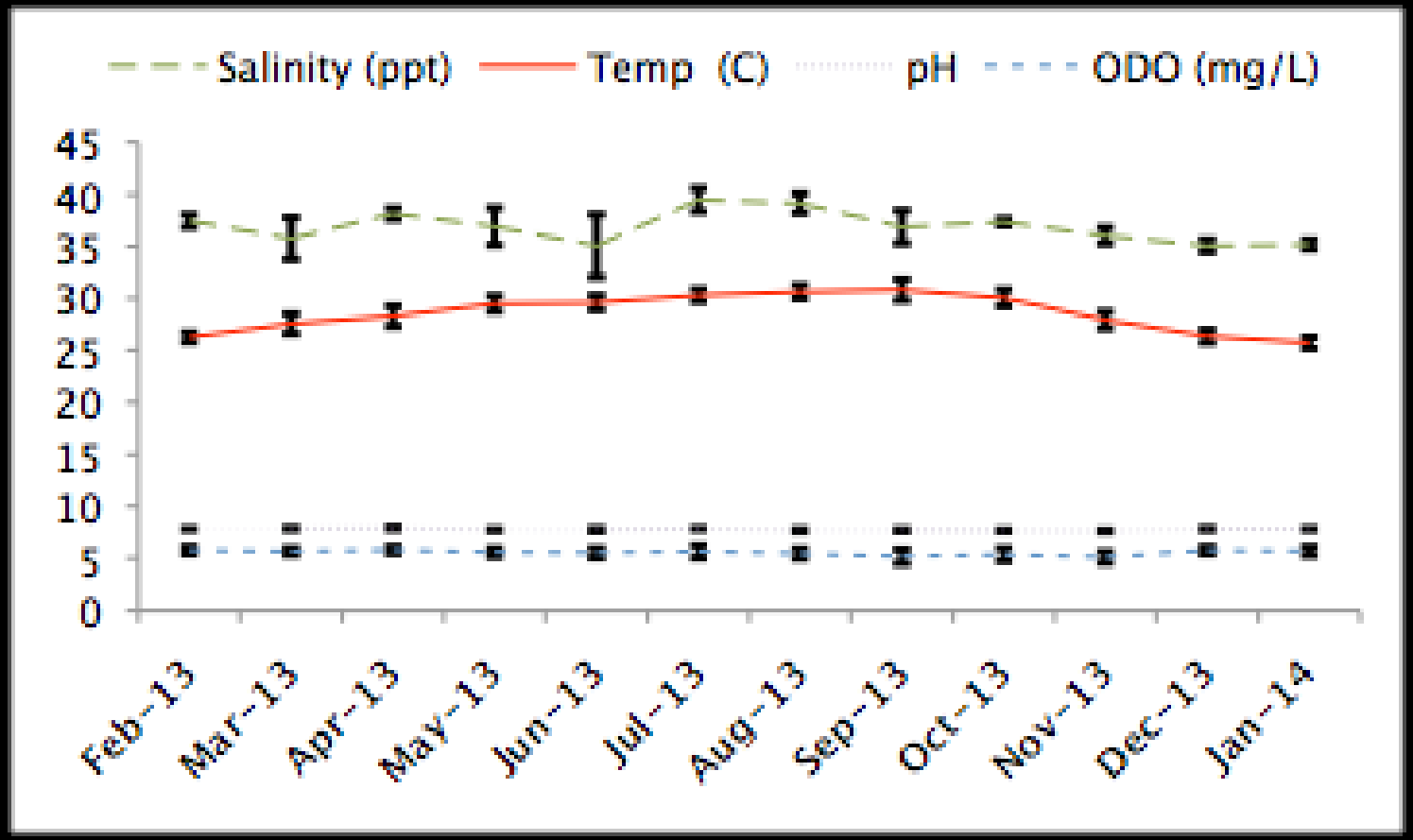


- *In-situ* Multi-parameter Water Quality Monitoring System (Sonde)
- Sonde: YSI 6920 V2
- pH, temperature (ºC), Turbidity (NTU), Dissolved Oxygen (DO, mg L^{-1}) and salinity (ppt)
- Programmed to log data in 1-hr intervals during the 1-yr study
- Total number of samples logged: n = 8,085
- Installed a weather station

Water Quality Results



Water Quality Averaged



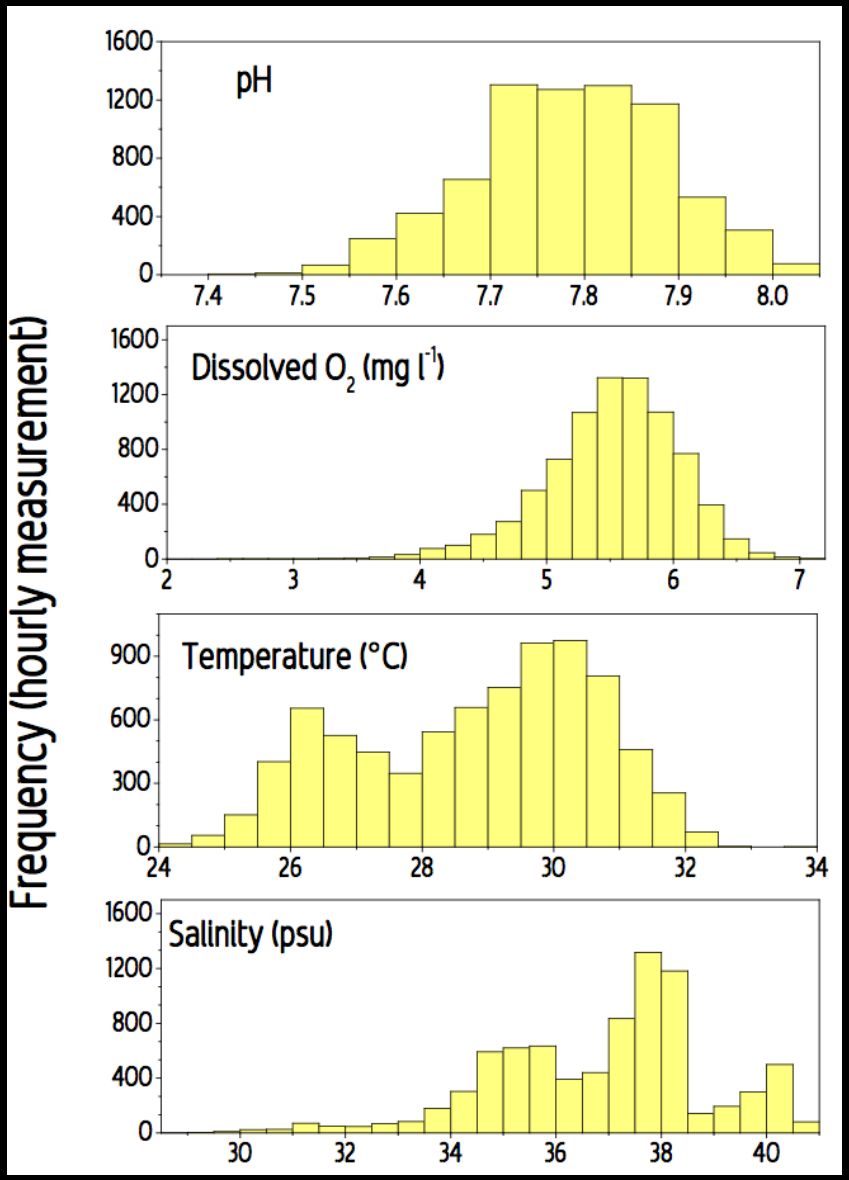
Turbidity:
- Some peaks associated with precipitation
- Data easily fouled

Salinity:
- Lower during rainy season
- Not always correlated with rainfall

Rain and Temperature:
- Seasonal

Dissolved Oxygen:
- Normal diel pattern
- Rarely dropped below 4 mg/L

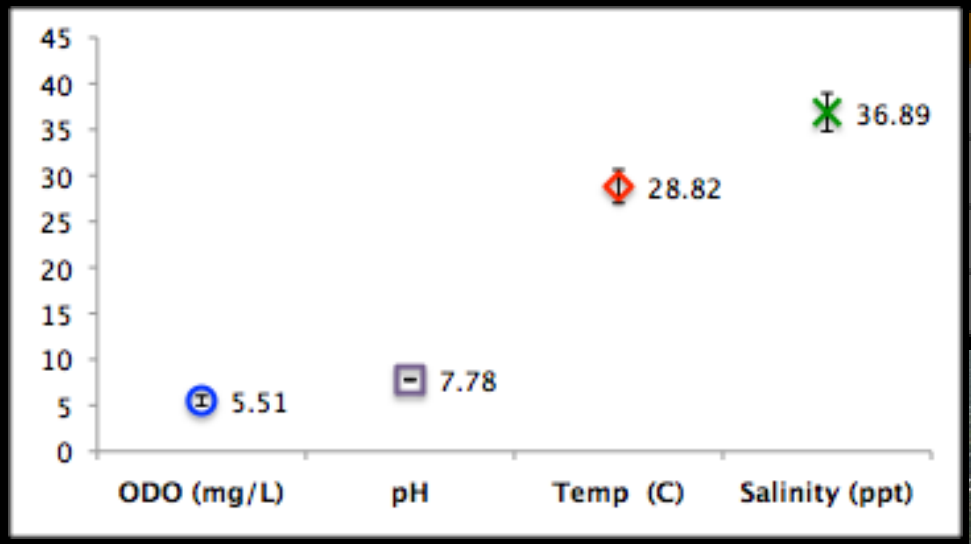
Hourly Frequency



Parameter	Mean	SD	Min	Med	Max
pH	7.8	0.1	7.4	7.8	8.0
DO (mg L^{-1})	5.51	0.53	2.04	5.55	7.03
Temperatre (°C)	28.8	1.8	24.2	29.2	33.9
Salinity (ppt)	36.90	2.01	28.98	37.38	40.76

- pH had very little variation
- Temperature and Salinity exhibit seasonal clusters

VI Water Quality Regulations



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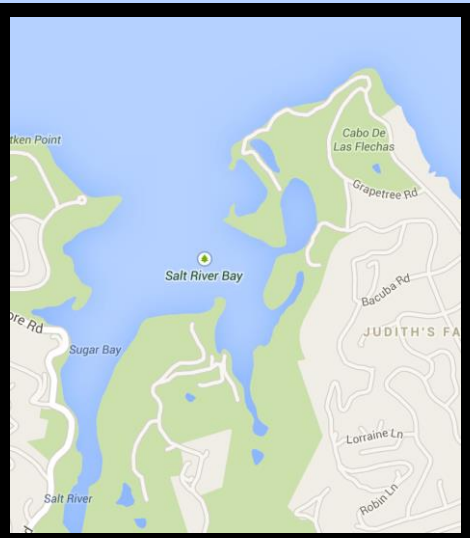
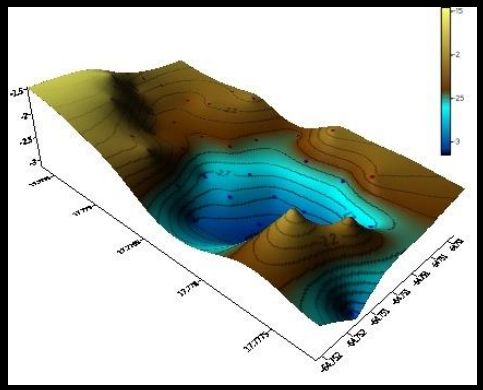
- Salt River is Class B
- Temperature - not to exceed 32 ^{o}C at any time
- DO - not < 5.5 mg L^{-1} from other natural conditions
- pH is 7.0-8.3 (tolerable limit)

Water Quality Comparison



Location	Area (m^2)	pH	DO ($mg\ L^{-1}$)	Temperature (°C)	Salinity (ppt)
Laguna Grande, PR	5			29.1±1.85	35.8±4.10
Mangrove Bay, VI	0.3	5.51±0.53	7.80±0.10	28.81±1.80	36.9±2.00



Sastre, et al., 2013

Summary

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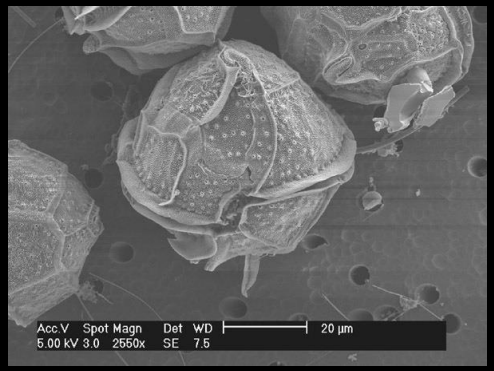
- First bioluminescent bay characterized in US Virgin Islands
- Major contributor: *Pyrodinium bahamense*
- DO was slightly below VI regulation
- Temperature and pH were within regulation
- Water quality was comparable with Laguna Grande Bay



THANK YOU

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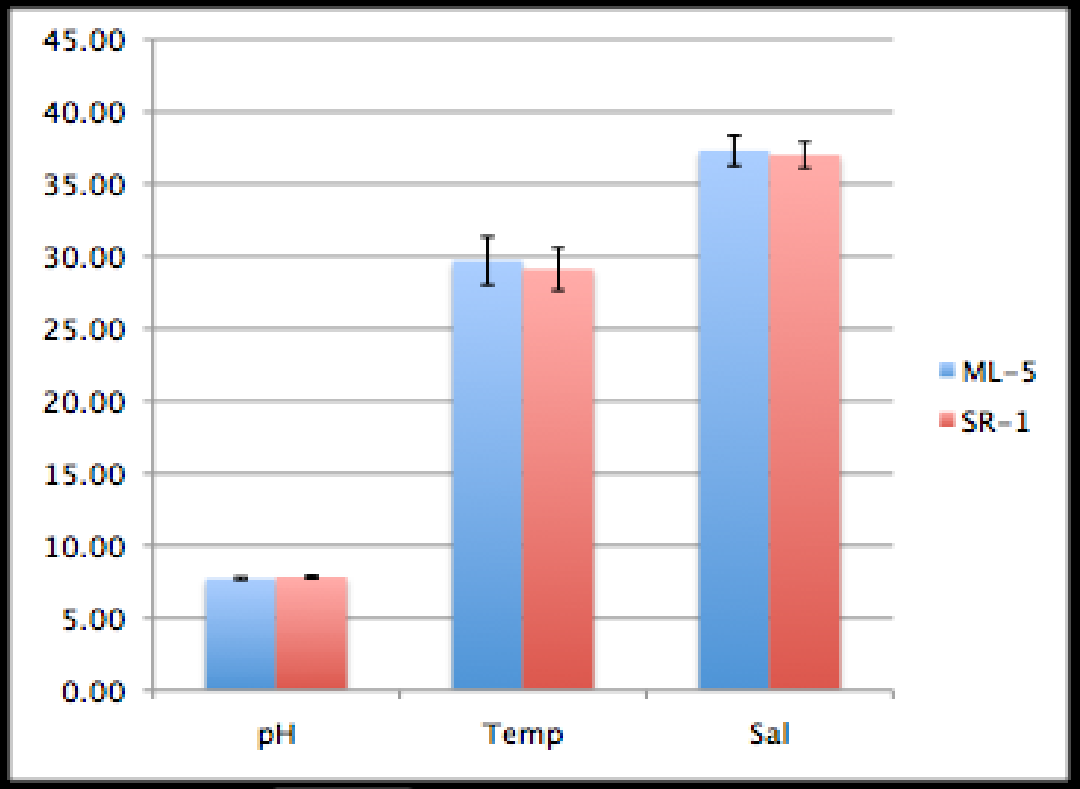
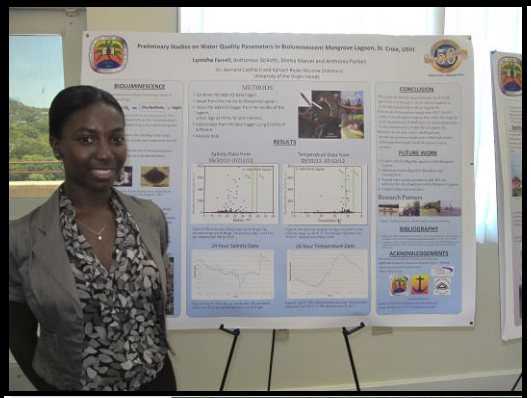
Comparative Study on the Water Quality of Bioluminescent Mangrove Lagoon and Salt River Bay, St. Croix, USVI (Anthonios Doliotis, Su 2012)

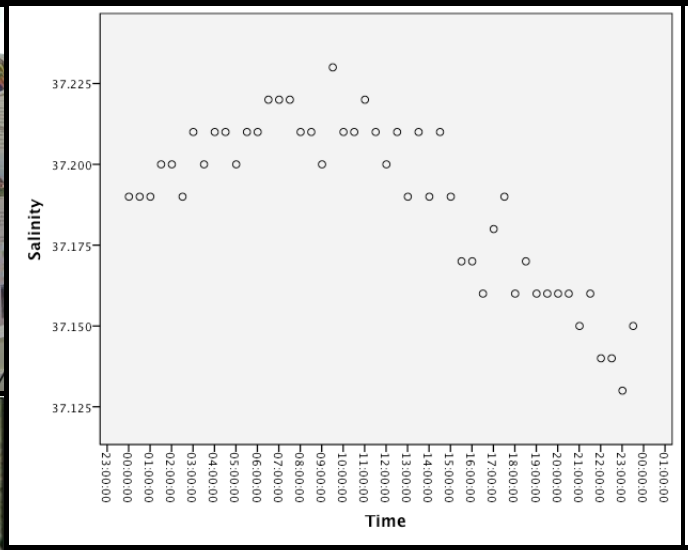


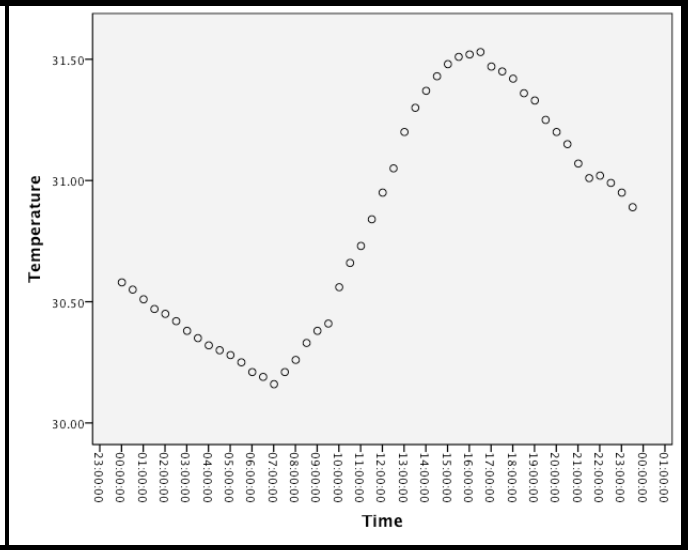
	pH	Temp (oC)	Sal (ppt)
ML-5	7.73	29.69	37.32
SR-1	7.84	29.13	37.01

- No significant difference in terms of pH, temperature and salinity
- No significant difference between day and night samples

Preliminary Results on Water Quality Parameters in Bioluminescent Mangrove Lagoon, St. Croix, USVI (Lynisha Farrell, Su 2012)



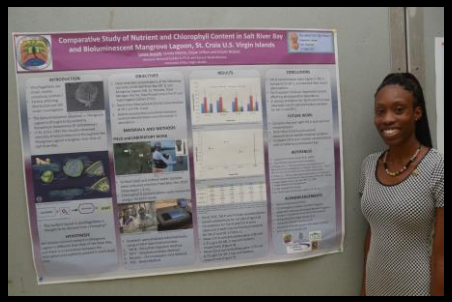


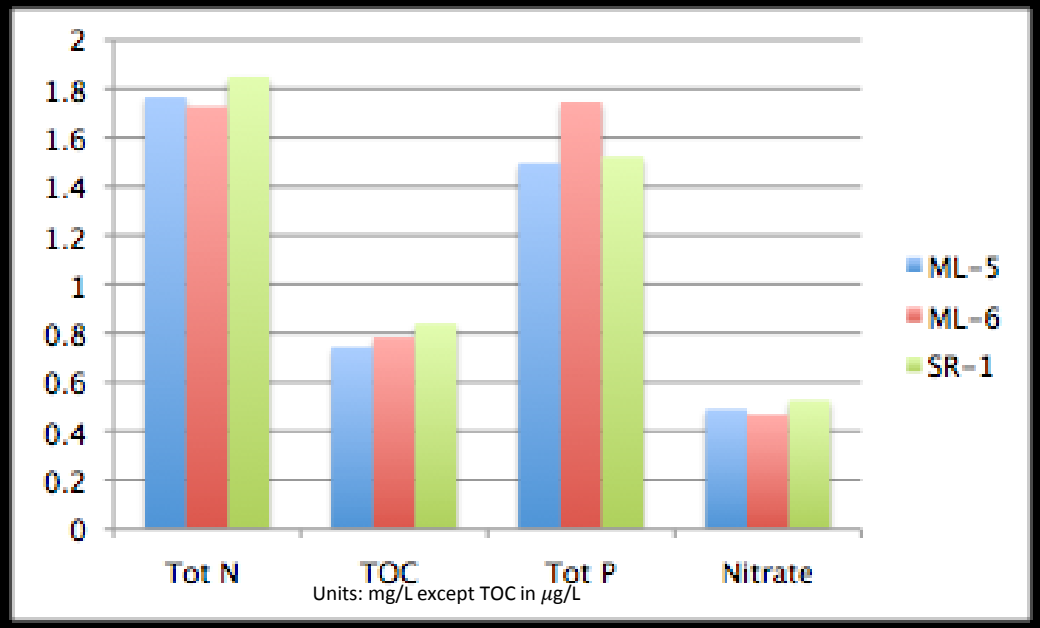


- The results for Mangrove's Salinity ranged between 36.04-38.48 ppt which is in the higher values versus the bioluminescent Indian River Lagoon, FL.
- The results of temperature ranged from 29.07-32.01˚C which showed Mangrove Lagoon fell within the range of high concentrations of dinoflagellates versus the bioluminescence in Indian River Lagoon, FL.

Emerging Caribbean Scientist

Comparative Study of Nutrient Content in Salt River Bay and Bioluminescent Mangrove Lagoon, St. Croix USVI (Jamila Martin & Lorne Joseph, Su 2013)

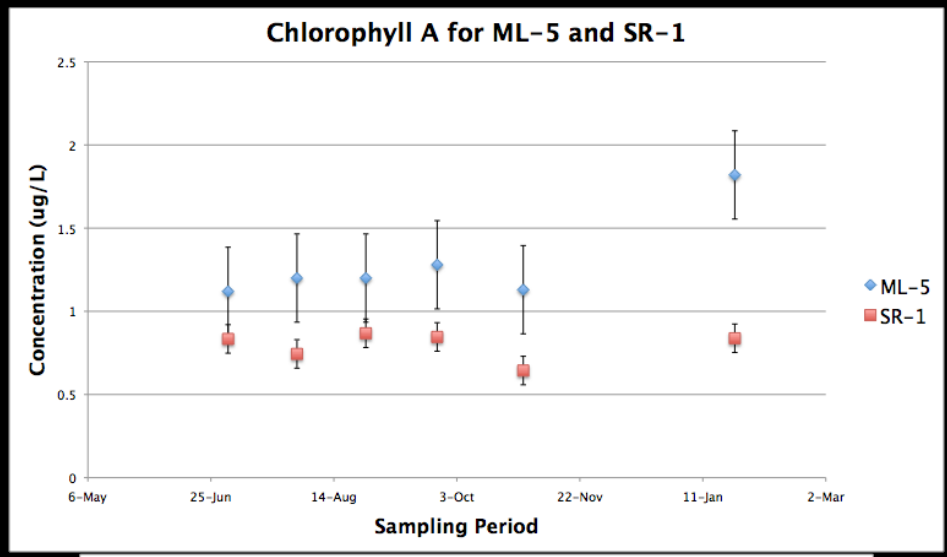


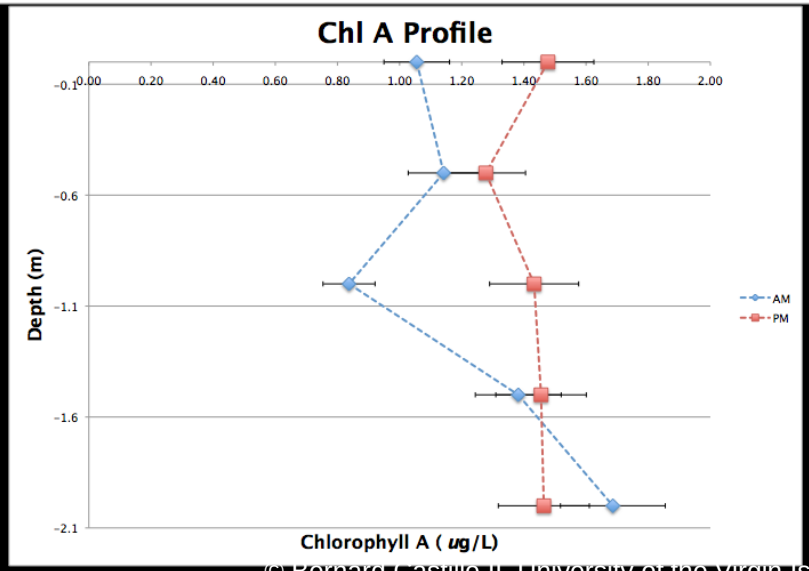


- Nutrients: Total N, Total P, Nitrates and Total Organic C
- The results of Pearson correlation analyses between Mangrove Lagoon and Salt River Bay did not reveal a significant difference for any of the nutrients tested.

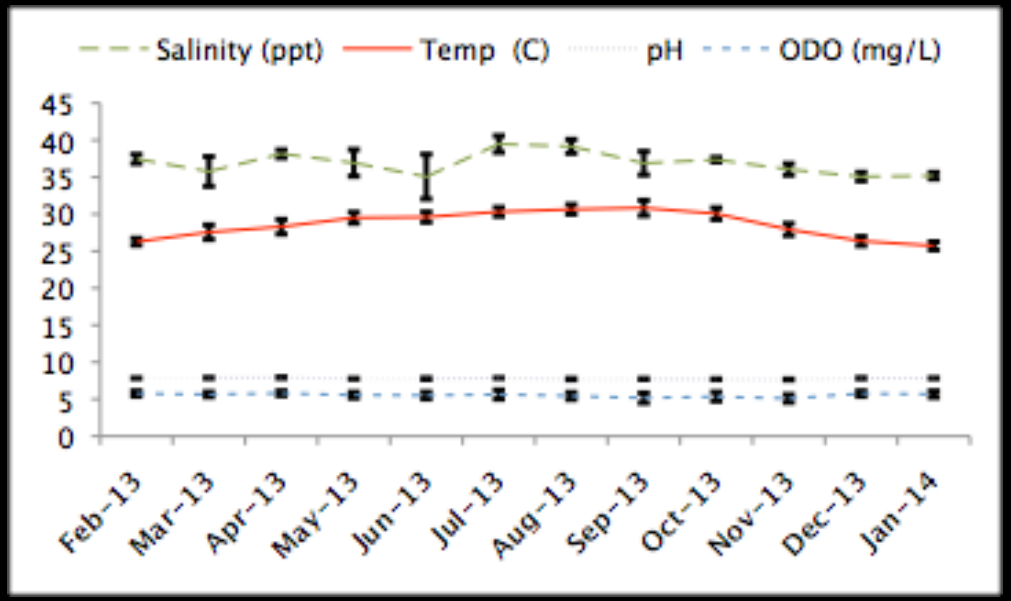
Vertical Chlorophyll Profiles in Salt River Bay and Bioluminescent Mangrove Lagoon, St. Croix, US Virgin Islands (Gejae Jeffers, Su 2013)

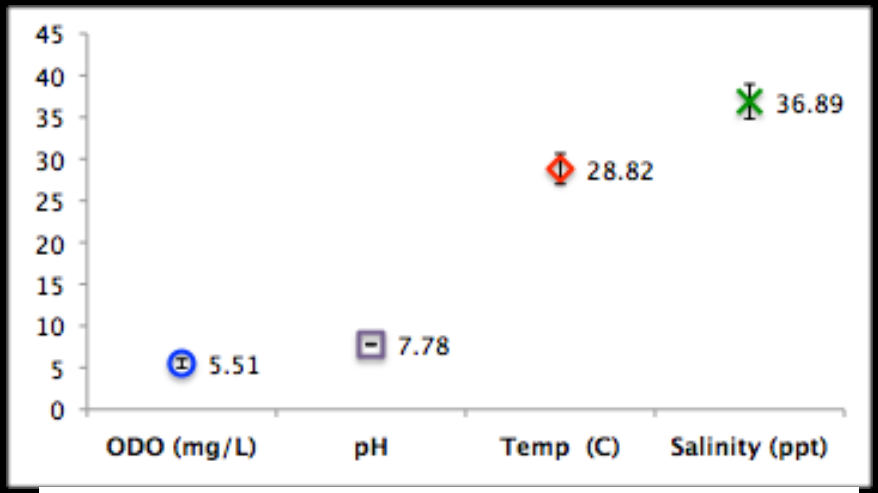
- Chl A was higher in Mangrove Lagoon
- Chl A was higher at the bottom during day then higher at the surface at night

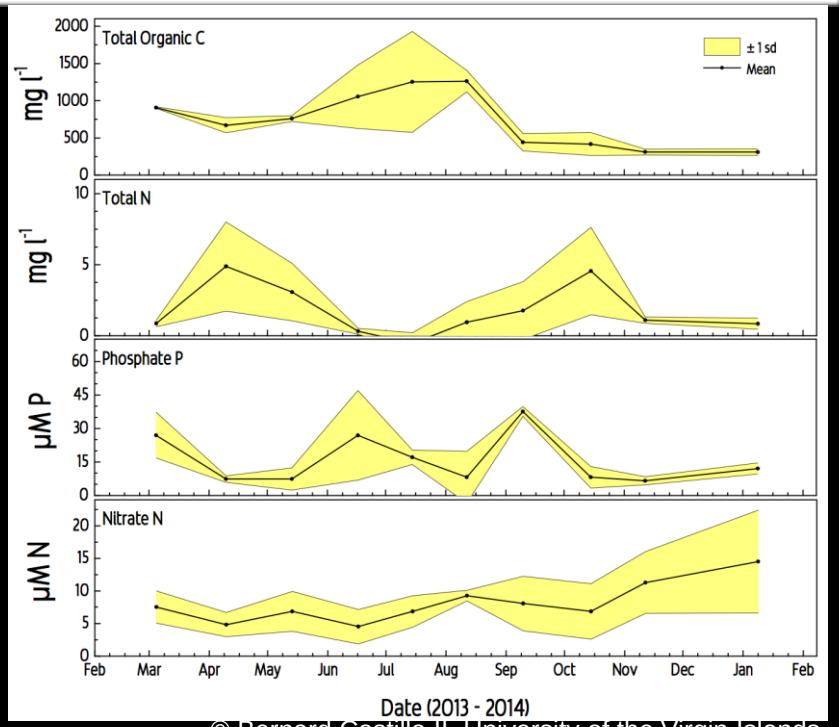




Ecological Characterization of Bioluminescence in Mangrove Lagoon, Salt River Bay, St. Croix, USVI







- 16,172 data points at 1 hr interval
- Little variation in water quality
- Nutrients (N and P) concentrations were high during April-Jul
- Increase of N and P in November